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Calendar for 1909-1910

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Enrollment of Students	Monday, September 6.
Class Work Begins	Tuesday, September 7.
Fall Term Closes	Wednesday, November 24.

Winter Term.

Enrollment of Students	Tuesday, November 30.
Class Work Begins	Tuesday, November 30.
Holiday Vacation Begins	Thursday, December 23.
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Spring Term.

Enrollment of Students	Monday, March 7.
Class Work Begins	Tuesday, March 8.
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Spring Term Closes	Friday, June 3.

The Great Southwest

By H. M. Stanford

Head of the Department of Physical Science.

Of all the great divisions of our country I venture to say that the one to which I ask you to give your attention for a little time, is, on the whole, the least visited. There is no portion of the United States less generally known and none better worth knowing. Its unattractive features have been unduly heralded abroad while its beauties have been overlooked. The hasty observations of tired travelers on their way from the glories of southern California lead them to speak of hot desert, bare mountain and monotonous plain; of cactus, sage and mesquite; of whitening bones, lazy Indian and shiftless Mexican greaser. It is with the other side of the page that I would acquaint you.

The Southwest, as we generally use the term today, includes western Kansas, Oklahoma and Texas, the territories of New Mexico and Arizona, southern Colorado and Utah, and that portion of southern California and Nevada east of the Sierras. This vast region, when in the main it was uncultivated, was, on most of the early maps, designated as "The Great American Desert." Granting the propriety of this former appellation, it is a fact today that the term desert, in the repellant sense in which it is generally used, can be applied to but limited portions of this area; and these are constantly diminishing.

This Southwest is at once the oldest and the newest part of the United States. The earliest authentic history of this region takes us back to the days of the early Spanish explorers following close upon the discovery of the continent. The success of Cortez in his conquest of Mexico, the wealth he uncovered there stimulated further adventure in the unexplored interior farther north. Everything was favorable to such enterprises. The Spanish monarch longed for further extension of his rapidly increasing domains; the nobility were looking for new dominions over which they might rule; the passion for adventure was rampant; while over all was the cupidity of avarice fostered by the reports of those who had returned from the golden palaces of the Incas and Montezumas.

Notwithstanding the fate of Ponce de Leon a few years before in Florida, that region was regarded as a scene for future glory rivaling that of Cortez; so permission to explore it was granted Pamphilo de Narvaez, who landed April 15, 1528, at or near Apalache Bay with a force of three hundred men. They wandered in unsuccessful quest through the states of Florida, Alabama, and Mississippi, till in the fall they came again to the Gulf of Mexico, probably near Mobile Bay, where they built flimsy boats, put to sea, floated by the mouth of the Mississippi, and encountered a storm in which all save four perished. These were

cast ashore in Louisiana or eastern Texas in the late fall of 1528, and were not heard of till April, 1536, when they arrived at Culiacan on the Gulf of California. Their trip across the continent during the intervening eight years rivals the celebrated Lewis and Clark Expedition nearly three centuries later. The party included Cabeza de Vaca, the treasurer of de Narvaez, two Spanish soldiers, and a negro slave, Estevan or Estevanico who became of considerable importance later. The published account of de Vaca sworn to on oath, though illuminated by the wildest exaggeration had much of truth in it. De Vaca and his companions were for some months the guests of Mendoza, the Viceroy of New Spain, after which they returned to Spain having first sold the slave, Estevanico, to Mendoza who wished to use him as a guide into the region to the north through which he had come. For the stories of "civilized people living in populous towns with large houses," and the fatal lure of the wealth there decided him to make an investigation. So he sent Fra Marcos de Nizza, a monk who had been with Pizarro in Peru, with the negro, Estevanico, as guide to discover if possible the truth as to the "Seven Cities of Cibola;" and the report of this expedition in 1539 was the first definite account of the Pueblo region of the Southwest. He told how the expedition passed through rich valleys with many villages, Estevanico being in advance and sending back reports till one came telling of his death before the walls of a considerable city in the midst of an extensive plain. Fra Marcos resolved to advance far enough to verify this information, and reached a hill from which he looked down upon a vast city, "larger than Mexico", but which his guides told him was the smallest of the seven. The sight alone being enough for the Friar, or, for fear a fate similar to that of the negro should befall him, he hastily retraced his way to Culiacan from whence his report found its way to Coronada, then governor of New Galicia as the northern portion of Mexico was then called, and finally to Mendoza, the viceroy at Mexico. Under his direction, an expedition was equipped for the subjugation of these cities, and, in February, 1540, a force of three hundred Spaniards and eight hundred Indians, with Coronado in command, started on what was destined to be the greatest exploratory trip on this continent. He followed the coast of the Gulf of California nearly to its head, then struck across the desert to the Gila, till finally after great hardships, in July, they reached the first of the cities which, after a brief resistance, was taken. But it turned out to be a poor village of but two hundred people, yet they gave it the stately name, Granada. Cibola was found to be the name of the country. From here one party was sent to the west, where was discovered the Canyon of the Colorado; others found and captured the remaining pueblos, not much greater than the first. Coronado was greatly disappointed, and sent back reports severely criticising Fra Marcos. Among other things he says, "It grieved the whole company that a thing

so highly commended whereof the Father had made so great brags should be found so contrary." And again "To be brief, I can assure your honor that he said the truth in nothing that he reported but all quite contrary saving only the names of the cities and the homes of stone; for although they be not wrought with turquoises, they are exceedingly good houses of three, four or five lofts high with ladders instead of stairs; and these ladders which they have for their houses are in a manner portable and moveable, which are taken away and set down when they please, and they are made of two pieces of wood with thin steps as ours be." From even these few extracts we have no difficulty in identifying the "Seven Cities of Cibola" with the Zuni pueblos of northern New Mexico. As confirmatory evidence of this, Cushing found among the Zuni, traditions of this expedition and even of the visits of Fra Marcos and the slaying of Estevanico a year earlier.

Coronado spent the winter in the villages along the upper Rio Grande, and the following spring set out in search of the rich and populous country of Quivera, which he was told lay to the northeast. The exact limit of this journey is not precisely known, but it seems probable that they crossed the plains of western Kansas, where they subsisted on the "hump-backed cattle" found there, wandering about in the fruitless quest of Quivera as far as the Missouri River in northeastern Kansas near the Nebraska line. Toward fall, they returned to the pueblo villages where they again wintered; and in the spring of 1542, the remnant of the proud army started for Mexico, where they arrived in the autumn nearly three years after their departure. Notwithstanding their disappointment as to the outcome, Coronado's name has come down in history as the discoverer of the Grand Canyon of the Colorado, the Pueblo Indians of New Mexico, and the bison of the Great Plains. So much for the historical setting.

In order that we may not enter too abruptly upon our Wonderland, it were well to review the steps by which we gradually reach it, though there is nothing essentially novel till we are well into Kansas.

The greater part of the last hundred miles in Kansas is rather desolate; and it is here, after ascending the southern watershed of the Arkansas River, that we begin to feel a new country. Iowa and parts of Missouri could easily be mistaken for southern Minnesota, while central Kansas reminds us forcibly of the western part of our state. But here we have our first hint of the truly arid, though it is but a feeble forecast of what is before us. The country is unoccupied as far as human habitation is concerned. Vast areas are bare sand, often banked along the fence bordering the track, so as to cover the fence posts, and with surface beautifully rippled by the wind. In places the sand is anchored down by the purple bunch grass, and in others, the grey sage is the sole remnant of vegetation. To the westward can be seen extensive sand hills. Occasionally we crossed green bottom lands with cattle grazing

along the shallow stream which meanders across the bed, while in other places deeply gullied hills, largely devoid of vegetation, were the feature of the landscape.

During one afternoon, we traversed in part, Kansas, Oklahoma, Texas and New Mexico which show no boundaries as far as landscape features are concerned.

This is in truth a pioneer land. But a few years ago, it was accounted a part of the desert, or at least semi-arid, and fit only for grazing, while now, it is devoted almost exclusively to agriculture.

We reach Tucumcari, New Mexico, late in the evening, where we are allowed time for a hasty lunch, and we change our watches one hour back to mountain time. This station marks the end of the farm and the beginning of the ranch; it is the gateway to the southwest proper. Though realizing this, we were scarcely prepared for what the morning was to reveal.

I awakened early, about four o'clock, and "looked upon a world unknown and nothing we could call our own." It was the desert, indeed. I could not have chosen a more fitting time for beholding it, than the one accident gave. At first, everything was indistinct in the dim light of a waning moon which together with the approaching dawn obscured most of the stars. I watched the morning star set behind hazy mountains, and the Great Bear decline in the northwest, while things nearer at hand took shape in the growing light. At about five thirty the train stopped at a station which I calculated from my time-table must be Alamogordo. Some of our party who had made the trip before had said that we should all try to be up in time to see Alamogordo. Well, here we were up and prepared to see whatever there was. By a comparison of my watch, the schedule of trains and the last station, this should be the place; but what was there to see? Desert for miles, with distant mountains for background while a large saw-mill with accompanying lumber piles stood near the track with nothing to saw anywhere in sight. Just then the voice of one of our party from across the aisle called, "Just come over here and see the swans!" Swans! What could be more improbable than swans in this barren waste! Hastily crossing the aisle, I beheld a contrast that was startling. It was a veritable oasis. There were the swans calmly navigating a lagoon back of which were acres of trees just bursting into springtime green, and with a grassy carpeting worthy of any park. The city is a beauty spot, and the explanation is not hard to seek,—it has water in abundance. The supply is from the Sacramento mountains which seem to rise just back of the city not eighty rods away. A branch of the railroad runs up into the mountains twenty-six miles to Cloudcroft at an elevation of 9,000 feet, the summer resort of El Paso, and the seat of a famous sanitarium. By this road are brought down the logs for the saw-mill.

Turning back to the right hand side of the track, we behold again

the desert. It is woefully desolate in its red barrenness, but uniquely picturesque with mesquite, the ever green yucca, or soapwood, and the grey sage, growing sturdily from the reddish sand. This is the famous Otero Basin, a former lake-bed, some thirty miles wide, lying between the Sacramento mountains and the San Andreas range to the west. Near the base of these latter mountains, and at some distance from us, may be seen the glistening white dunes of gypsum sand, an interesting feature of the Basin. Recently, it has been found that water could be obtained at a moderate depth throughout the valley, and here and there are forecasts of the great struggle between man and the desert, where plucky pioneers have reared small frame or adobe shacks with the invariable windmill, or gas-engine house, more necessary than human domicile; for without the water they could not live here a week. A patch of green barley, or alfalfa, a few cattle, mark the beginning. In this struggle man will win, but the costs, the sacrifices, are many.

Upon reaching El Paso, I experienced a distinct shock at finding things so different from my preconceptions. My reasoning, I suppose, had been something like this: Texas is, along the Gulf, low and the whole state is, in the main, flat; El Paso is in Texas, therefore it must be low and flat there. But it is distinctly mountainous, and at an elevation of 3,762 feet. Then I had thought of the Rio Grande, one of the foremost streams of the country, as a mighty river with broad bed and low banks. But these ideas were ruthlessly shattered. The river runs through a distinct gorge, the banks are high, and the bed ridiculously narrow. The bridge, crossing it, does not seem to be more than a block in length, while beneath, the river, a thick yellow cream, sluggishly winds about on the adobe clay of its bed. It looked as if a boy could wade across it. After my return home a month later, I saw in a newspaper that the river was then the highest known since the 80's, that it filled the channel to the brim, and threathened the destruction of the bridges. Thus it is with desert rivers. So it is the "Grande River" once in awhile, and should at no time be treated disrespectfully, for any river in a dry land is a great thing; and the Rio Grande is the largest stream between the Mississippi and the Colorado.

The city of El Paso is worthy of more than mere passing mention. From a frontier town of but six hundred people in 1880, distinctly bad in reality, as well as in reputation, it has become the metropolis of the Southwest, its central distributing point and manufacturing center. It has little in common with the empire of Texas to which it governmentally belongs, or with its great seaport, Galveston, nearly 1,000 miles to the eastward. Its outlook is to the west and southwest. It is the natural gateway to the rapidly developing resources of New Mexico, Arizona, and the states of northern Mexico. It now claims a population of 45,000, and, according to a circular issued by its Board of Trade, it is "the biggest city, in the biggest county, in the biggest congressional

district, in the biggest state, in the biggest nation on earth.'' Investigation verifies the truth of this assertion, except as to its being the ''biggest nation on earth''; and the average American accepts this without proof. The city has over fifty blocks of paved streets, thirty miles of electric railway, and is brilliantly lighted with electricity. There are eight different railways centering here, which tap the mines, cattle-ranges, farms and timber lands in all directions. Its commercial importance is also shown by the fact that its custom house ranks eleventh among those of the United States, exports and imports last year amounting to about $11,000,000 each. Machinery, especially mining machinery, represents a large part of the exports. Here is located the largest custom smelter in the world, and the only steel converter in the Southwest.

We stayed over between trains here, so as to visit Old Mexico long enough to say that we had been in foreign lands, crossing by trolley the bridge on which former executives of this country and Mexico have met, and shaken hands across an imaginary boundary line, a custom which Taft and Diaz expect to vary this fall by each marching clear across, and visiting the other's domains. The Mexican city, formerly known as El Paso del Norte, now Ciudad del Juarez, is a place of some historical significance. Its present name was given it in honor of Benito Juarez, a full-blood Indian, who was president of Mexico from 1858 to 1865, when, after constant internal strife, he was driven out by the French who placed the ill-fated Maximilian on the throne. Juarez retired an exile to this little town on the frontier, where he lived for two years till, in 1867, the United States found time to enforce their recognition of his government and the French retired, Maximilian being taken out and shot. Diaz and the national troops again occupied the capital, and in the election which followed, Juarez was again chosen president. In 1871, he was re-elected, but there was constant revolt which Diaz finally joined, in the midst of which in the following year, Juarez died. He is regarded as a great national hero.

The city is a great contrast to El Paso; from being ten times the size of the latter in 1880, it has sunk into comparative insignificance beside the bustling Americanism of the former. The Mexican Custom-house just across the bridge and the post office are modern brick structures, but the rest of the city is adobe, and much of it is very ancient. This was our first introduction to adobe as a building material, so commonly used in the Southwest. Adobe is sun-dried brick. It is moulded in varying sizes, twelve by eighteen by six inches being a common size. The walls are sometimes twelve, and, again, eighteen inches thick, according to whether the bricks are laid lengthwise or crosswise in the wall. The roof is flat, or nearly so, being made of poles covered with earth. I wondered how a roof such as this could shed water; and upon inquiry found that it does not if the rain is protracted; but the rains are

usually short and sudden without giving time for the water to soak through. An opening made by leaving out a couple of bricks serves as a window, sometimes with, but more often, without glass. The cheapness of these dwellings may readily be imagined; and another distinct merit is that they are cool—or rather less hot—than outside, on account of their thick walls. The adobe stands pretty well in this dry climate. Often to increase its life it is plastered on the outside.

The population of Juarez seemed to be wholly Mexican. We visited the old adobe cathedral, said to have been built in the sixteenth century. We stumbled upon services there, it being Good Friday, and had a chance to see the interior, well worth a visit with its roof carved by Pueblo Indians. We saw the Bull-ring, where fights are held on festal occasions.

Leaving El Paso over the Southern Pacific pulled by one of its oil-burning engines, for it has been found more economical to use crude petroleum on this system, we first pass the large smelter, where upon our return we spent a most interesting half day. The route skirts along the north bank of the Rio Grande overlooking the bottom-lands, covered with adobe houses, then crosses the stream, here nearly dry, and follows the west bank a few miles, before starting on the long pull across New Mexico and Arizona, the longest stretch of desert in the country. To our left, we see the first of the chain of iron or stone mountains, marking the boundary between the United States and Mexico. There are 258 of them, and they extend, at intervals of about three miles, from here to the Pacific. The desert here is the real thing, and from the car window looks dreary enough. The railroad follows a wide sandy floor with mountains in the distance on either hand, some of the higher ones snow-capped on their northern slopes. From a distance they seemed bare of plant growth with ridges and gullies standing out in the clear atmosphere with a distinctness and harshness as if we had here but the skeleton of the earth. The desert nearer at hand is by no means bare, but has a somewhat varied vegetation. The most interesting plant is the yucca, or soapweed, a smaller edition of the more vigorous Spanish bayonet found farther west. This sturdy and luxuriant, but useless plant is first seen on the sand plains of southern Kansas from whence it increases in occurrence till the climax is reached north of El Paso, where hundreds of acres are covered, so as to appear almost as if cultivated. Across New Mexico there are spots where it is almost equally exclusive. Its narrow pointed leaves always green, a foot or more in length, radiating from a short stem, become reflexed upon dying: so that the crown of green is pushed higher and higher each year till it comes to have the appearance of a palm with a trunk six or eight feet long. Then there are places, where the sage brush has the field, and still others where the mesquite has undisputed possession.

From this point on several alkali plains were crossed. We were told that after a rain water stands till it evaporates, as the fine dust,

when parched is impervious to water, which accounts for its lack of plant life. On one of these plains in Eastern Arizona, water has been found for irrigating purposes at a depth of but forty feet. The whole valley had been filed upon by one thousand prospective settlers, and the town of Wilcox in the midst of this tract was enjoying a boom. We crossed several mountain ridges, the highest being at Dragoon, 4,600 feet high, and dropped rapidly into Tucson at about half that elevation at about nine o'clock in the evening.

This is a most interesting city in many ways. The claim is made by some of its enthusiastic residents that it is the oldest city in the United States, but a careful investigation of the authorities fails to reveal a basis for this claim. Saint Augustine and Santa Fe certainly both antedate it by some years. It is known that an Indian village, called Pueblito del Tucson, was in existence on, or near, the spot before 1772, but how long before this time is not certainly known. Until the Presidio of Tucson was organized in 1781, it is not probable that the inhabitants consisted of other than Indians. This Indian village consisted of adobe houses, a church and a mission surrounded by a wall as a protection against the Apaches; and many and bloody were the encounters with those savages, reputed the worst of our noble red men. Upon this territory becoming United States property by the Gadsden Purchase in 1853, Tucson became an overland mail station and military trading post, and with the advent of the Southern Pacific Railway in 1884, it took its place as the metropolis of the territory, and so continues to this day, with a possible rival in Phoenix. From a quaint old Mexican pueblo, and a part of the city remains in evidence, it has become a modern American city. In ten years it has trebled its population, claiming now about 25,000. It boasts the state, or rather the territorial university. Here, I spent an enjoyable forenoon. The president of the university and several instructors are alumni of our own state university.

The city has a beautiful Carnegie Library, an imposing hotel, the Santa Rita, of Spanish architecture, a splendid new railroad station costing upwards of $100,000, the old Pueblo Club building costing half as much and many more all having been erected within three or four years.

The setting of the city is all that could be desired. It is on a plain as level as a floor, surrounded almost without break by steep grey mountains. To the northeast, looms up the towering masses of the Santa Catalinas with their highest peak 9,200 feet, but 17 miles from the heart of the city. Further to the east is seen the purple maze of the Rincon Range, to the westward right at our doorsill, as it were, are the apparently bare brown Sierra Tucson, north of which are the Tortilitas; while to the south and east, are the Santa Ritas with the highest peaks of any.

The Santa Cruz River is supposed to flow through Tucson, but when I was there, there was no surface indication of the fact. The stream rises in southern Arizona, takes a loop down into old Mexico, then runs up through Tucson, and is lost in the sands to the northwest about half way to the Gila, its ostensible destination. Like all desert streams, it has a habit of sinking out of sight at times, only to reappear again further on. ....

Tucson was the center of our operations for a couple of weeks, and it was as fitting a place to become acquainted with the great southwest, as any that could be found. Some years ago, when the Carnegie Institution decided to establish a desert laboratory, somewhere in the southwest, after a personal examination by experts of the most available spots, Tucson was selected as the place. The selection was most difficult on account of the extent and variety of desert found. It is favorably situated at the centre of the vast cactus-land. It is at a moderate elevation, being 2,390 feet above the sea, hot at times to be sure, but dry and bracing. There is almost always a breeze and the humidity is low. The laboratory is about two miles from town; about 300 feet up the side of the rugged grey slope of one of the Tucson mountains which rises 500 feet or more, to a summit crowned with the still-persisting remains of an old Indian fortification. The spacious building is constructed of rough volcanic rock, gathered and hewn on the spot. It has thick walls, an overhanging roof, containing an air-chamber with openings for circulation, so as to counteract, as far as possible, the fierce heat of a cloudless sky, and a temperature that, even in the shade, often reaches 110°F. Our party spent a most enjoyable afternoon at the Laboratory. The director is Dr. Daniel Trembly McDougal, formerly of the Bronx Botanical Gardens of New York, and before that of the University of Minnesota. In general, the work of the laboratory is the study of the conditions governing the origin and development of the types of vegetation found there, which are at present little known. With the thousands of miles of desert, green with its own peculiar, but economically valueless flora, it is well worth while for our government and this institution to seek to develop valuable plants, tough enough to resist the hardships of that environment. The view from the laboratory hill is charming. Spread out below is the city, green with semi-tropical foliage, set in the midst of dark green alfalfa fields. Across and beyond are the brilliantly illuminated masses of the Rincon mountains having even with their distance a vividness of detail through the shimmer of heat and the blaze of reflected light partly veiled in purple. Nearer and behind us are the desolate defiles of the Tucsons which, with the sun behind, give contrasts of hard profile, brown bluffs and dark shadows. The rugged topography of the Santa Catalinas, scarcely noticeable, in the glare of the high sun, is thrown into bold relief when the shadows begin to lengthen. Then the dazzling purples and yellows of

midday give way to the deep blues of the valley which contrast with the reddening tones of the slopes and ridges higher up and the green of the well-wooded summits. Verily the scene justifies the location of the laboratory here even if it were not that in desert climate and in rich and varied flora of desert character, Tucson is so typical.

The desert is a constant surprise to the beholder. First, you note with amazement that it is not a barren and desolate waste, but is teeming with vegetable life, plant, tree and shrub. Looking across the level plains, strangely called valleys, the earth seems covered with vegetation; but a closer view shows zones of bare sand between the bushes, and we soon notice that each plant, each shrub, is an individual, solitary and alone, with never a cluster or clump, as we find them with us. Each is surrounded by its patch of bare sand, and is thus perfectly symmetrical in its development, and gives to the traveler the idea of a nursery. The explanation of this condition is not hard to recognize—there is not enough water to support contiguous growth; the desert rains are too scanty for more than one plant every five or six feet.

Another surprise, and one that goes to fix the nursery idea, is that one area is given up to a particular species of plant to the total exclusion of all others; while adjoining it is a totally different plant and none of the first. Then to prove the rule you will come to a place where as an exception, Nature has jubilantly thrown together samples of all the species in the neighborhood. Then the arrangement of mountain and plain is striking. There are but these two features in the topography. Wherever you are on the plains you are nearly surrounded by rugged ranges as walls to your amphitheater. Without foothills or warning of any kind they rise at a step from the flat floor and with an abruptness of slope that taxes your ability to the utmost to ascend. This peculiarity and the almost artificial appearance of the mountains is due to their being but the summits of partly buried ranges; while the plains between cover buried valleys often hundreds of feet below. Most of the mountains in this vicinity are not over 4,000 feet above the plain, though some reach to nearly twice that elevation, having summits dark with pine forests and with patches of snow on their northern slopes.

Another feature of the desert landscape is the arroyo, or erstwhile watercourse. You come upon them without warning and it is sometimes with difficulty that you can cross, for they are often from six to eight feet deep and fully as broad. As a source of water they are for the most part a delusion; but as they are usually bordered by trees a little larger than usual and grass, they are sought as camping places.

By far the most interesting in the way of contrast with our own is the plant life of the desert, and the travler needs must become an amateur botanist, whether he will or no. With us all the vegetable world invites you with its shade, its green carpet and its fruit. But here every thing is armed and armored against you, and it can never be accused of

carrying concealed weapons either. They are all drawn and ready for action. The cactus has its spines and hooks, the mesquite its long slender thorns, the cats-claw its short curved ones, the agaves their pointed leaves and the yuccas their serrated ones. And yet with such a welcome you are attracted and charmed by the variety of floral form, and its adaptation to the existence it needs must live. Among the trees, the palo verde is the most beautiful and interesting. Its Spanish name, means "green tree." It grows from three to fifteen feet in height according to moisture, with bark of smooth, delicate, asparagus-green with terminal twigs like green darning needles, where we should expect the leaves to be. They say it has small leaves in their season, but when I saw it, none were in evidence. Then there is the mesquite bush, or tree, for it grows under favorable conditions to a height of 25 feet. In habit of growth, it is very much like an apple tree with its crooked branches and flat-topped spreading form. It is the most reliable fuel in the southwest and it is used for building sheds and corrals, and by the Mexicans in making furniture. It is equipped with ferocious thorns which to the novice would seem to prevent its use at all. This tree seemed especially susceptible to the mistletoe, great bunches of that parasite, often two feet in diameter overloading its top, and eventually causing its death.

Often mistaken for the mesquite, especially at a distance, is that acacia of the desert known as the "cats-claws"; and well named too. Then, there is the iron wood somewhat similar in form, with wood so heavy that it will not float.

The creosote-bush, or grease-wood, is perhaps as widely characteristic of the mesa as any plant found there. Each consists of a cluster of woody stems spreading from near together at the earth radially for from three to five feet. The few branches are found only near the ends, where are borne the shiny leaves of a bright green color, and in April delicate flowers of a pleasing yellow. This bush serves a very useful purpose in holding the sand from drifting.

Most picturesque in its oddity, and unique among the varied forms of plant life I have seen, is the ocatilla. Its stem is a mass of solid wood all beneath the ground from which arises a dozen or more slender branches often 20 feet long, symmetrically and gracefully bending outward. Its leaves one and one-half inches long, stemless and of a dark green color grow thickly along the whole stem. This is its appearance after a rain. When it becomes dry, the leaves wither and fall, all except the midrib which persists as a stout thorn over an inch in length, making the plant a rival in its armor to anything in the cactus family. When I saw it in April each branch bore at its tip a spike of scarlet, bell-shaped blossoms. But the most striking botanical features in this land of the unique are the cacti. Although a few prickly-pear are seen in crossing New Mexico, my introduction to this family came the next day after my arrival in Tucson, when we made a trip by auto seventy

miles to the northeast, skirting the north end of the Santa Catalinas, and ascending into the Galiuras across the San Pedro Valley. The first plant that attracts the attention of any traveler going out into the desert slopes about Tucson, the one that gives the key-note to the landscape, is the Giant Cactus, or Sahuara. All over the mountain sides, stand these stately pale green sentinels, "fluted Corinthian columns surmounted by candelabra." The stem is always vertical, but with a variety and multiplicity of branch forms that are bewildering. Some, though with stems twenty-five feet or more in height, have no branches, this being the usual condition with the shorter ones. Others may have branches running all the way from knobs like footballs to great arms as large and long as the stem itself. These arms ordinarily start out from the main stem, and then bend up, but the variation in fantastic twists and bends is one of the reasons we never tire of watching them. Every stem and branch is built on the accordeon plan with fluted surface bearing hooks and spines in clusters along the outer angle of the plaits. In the rainy season the plaits flatten out; during a dry time the plant shrinks and the plaits close. The interior is pulpy and surrounded by a compact circle of ribs, smooth and uniform in size, about an inch in diameter. Upon the decay of the plant, these ribs are all that is left. Seldom is a Sahuara of any size seen without several woodpecker holes in it. These birds find it easy digging, and in the cool moist interior, they are safe from all invasion. This strange specimen of the plant kingdom flowers in May and June, so I missed the incongruity of seeing the cluster of white tubular blossoms right on the end of the stem. The fruits which appear later, and are about the size of pears, split so as to expose the crimson pulp within, dotted with its black seeds. It is said to taste like ripened figs, and is relished by the Indians and Mexicans.

Another cactus, one that I did not see, as it grows 40 or 50 miles to the southward, is the organ-pipe cactus, somewhat similar to the Sahuara, but not so large nor striking. In this one, several stems spring from the same base. It yields two crops, annually, of a fruit most excellent and palatable to all.

The Bisnaga, or Barrel-cactus, the largest of a numerous family, is one of the most valuable of desert productions. It does not often exceed three feet in height and about half that in thickness; it is a pompous portly fellow, deeply fluted and thoroughly protected by clusters of the stoutest and sharpest of long curved spines. But to the weary waterless wayfarer, it is a boon indeed, for it is a veritable keg of water. Just slice off the top, pound up the pulp till the water begins to appear in the cavity, squeeze out the fibre and discard it, and you will have several pints of a surprisingly cool, slightly sweetish, herbaceous-tasting water. It is very satisfying to thirst, notwithstanding its sweetness; and this latter property is utilized in that it is made into candy, cactus-candy

being in some demand by tourists in this region. The supply does not seem equal to the demand for some reason, at least in Tucson; but go to Donofrio's in Phoenix and you can get a fancy box of it decorated with pictures of cactus-land, and the way the juice is gotten from the plant. There are several other cacti of this group much like the bisnaga but smaller, some with crimson spines, covering the whole exterior, and gorgeous flowers with fruits much sought after by various animals.

We must now give a description, or rather a warning, of that most villianous group of all, the Choyas. Hornaday, in describing it, says, "First one may well pray to be spared from coming in personal contact with any of its members; and, secondly, that in the event of contact, grace may be given you to go on through life without using language." Bigelow's choya, the worst, is under three feet in height with a short stem and stocky joints growing one upon another, and covered with long greenish white spines. In the fall these joint-branches all fall off, when they are worse, if possible, than when on the stem. The spines will go through the sides of your shoes with ease, and even through the sole, if stepped upon. The Tree-choya, similar in character but much larger, has spines mild in comparison with the smaller species, but bad enough. Its stem is most interesting with its chasing of elliptical hollows on the surface; and even after death its woody, hollow, cylindrical skeleton, full of holes regular in arrangement and outline, looks like a piece of carved fret-work.

The flat Prickly-pear cacti are familiar to all as house-plants. Naturally they are somewhat sparsely spined, but in the desert botanical garden were some without spines, "the spineless cactus" of the newspapers whose origin is usually attributed to Burbank.

In most of the cactiform plants, the stems have become thick and fleshy, so as to perform the functions of leaves. Exposed to dryness three-fourths of the year on sandy plains, or in crevices of rocks on plateaus or mountain sides, their whole organization has come to correspond to their habitat. Ordinary leaves have been metamorphosed into thorns and spines which project from all parts of its green stem, and sufficiently protect it from the ravages of hungry and thirsty animals, without which protection it would be doomed. Interiorly, most of these plants have a cell-structure known as aqueous tissue which serves for the storing up of water as a reserve, during the long dry season, as a camel uses his hump. Many of these plants are literally tanks of water, the tissue, interiorly, containing, in some instances, as much as 96.3% of water. The root systems are extended laterally, and usually lie close to the surface, so as to gather in the scanty moisture, as it falls, from as great an area as possible. Some of the large Sahuaras are veritable standpipes of water, calculation showing that they contain many barrels. This, unfortunately, cannot be used, as it is bitter and nauseating. Interesting experiments were being conducted at the laboratory, which showed that

a Sahuara six feet high cut off even with the ground would live for years, sustained by the water within. But this most interesting subject, the plant-life of the desert, I must leave sometime; and this is about as good a place as any.

Of the animals of the desert I saw but few, as we were not specifically hunting them. Wolves, mountain-lions, lynxes and coyotes are found in the more secluded regions. Antelope and mountain sheep abound in places. Squirrels and rabbits, both cotton-tails and jacks, are common. The so-called Pack-rat, with his ranch fortified with choya joints, and the Kangaroo-rat, a somewhat smaller animal, nocturnal in habit, have their burrows everywhere. Of reptiles, the rattlesnake is plentiful, but he was not out of winter quarters in April. Scorpions, tarantulas, and the Gila Monster, a giant lizard, are sufficiently numerous, for all are poisonous. The skunk is about as much feared as any animal, as its bite, so the miners claim, almost invariably, results in hydrophobia.

Of the bird-life seen, the most interesting to me was the Road-runner. As our auto sped along the surprisingly good roads leading into the foothills, every little while we would see one of those erratic birds suddenly start off from the road among the cacti, or run along ahead of us for rods, at no mean pace. It is said to outrun a swift horse for short distances. The bird is about two feet in length, half of which is a slender tail widening toward the end, so as to give the appearance of a steering-oar. Though we were not near one at rest, and its gait was too rapid to note it carefully, it seemed to be dark greenish in color, to have a distinct crest, and a bill slightly curved at the end. It is alert, suspicious and inquisitive in demeanor. On this trip we were constantly disturbing the desert quail, known as Gambel's quail. It is about the size of our Bobwhite, but is peculiar in that it seldom flies; but with head thrust stiffly out, and plumes pointing forward, it runs with astonishing rapidity, darting about among the bushes in a most erratic manner. Then there is the cactus wren which makes its nest in the tree-choya, an impregnable refuge. Mention has already been made of the red-shafted flicker which makes its home in the giant Sahuara. Occasionally we saw a hawk similar to ours; but a flock of red-winged blackbirds with their springtime carol in some cottonwood trees at Mammoth in the San Pedro Valley very nearly made me homesick, for this was one of the few familiar sights and sounds in this land of strangeness.

It is appropriate and logical, from our accepted course of organic evolution, that after the plants and animals of the Southwest, we should consider its peoples; and chronologically it is right that we should begin with the earliest. This portion of our country contains the most extensive and best preserved remains of prehistoric people of any in the United States. This so-called Pueblo region embraces all of New

Mexico and Arizona, a small portion of southwestern Colorado and southeastern Utah, together with portions of northern Mexico. This area is determined and limited by the physiographic conditions which are very definite. As to climate it is semi-arid. Dryness prevails. The precipitation is very unequally distributed throughout the year. Heavy rainfalls of but a few hours duration are followed by months devoid of moisture. The character of the soil is such that the effects of rainfall disappear rapidly. Absorption, evaporation and drainage proceed with great rapidity. There are extensive plateaus with little grass, narrow arable valleys, and vast stretches of sandy desert. Much of this area is over one mile in altitude. Game was scarce and fruits deficient; in fact there was no indigenous food supply. This rendered fixed abodes necessary, and compelled an agricultural basis for their sustenance. These early peoples were little disturbed by the nomadic plains tribes, for there was nothing to attract these marauders. Cultivation led to irrigation, so the settlements came to be, as a rule, in the narow valleys, or on the cliffs, or mesas, bordering them, and within reach of water. Though ethnologically different, the tribes were all alike in that they were sedentary rather than nomadic, had stable and not traveling homes, and were producing rather than predatory. There are more archeological remains in the Southwest, than anywhere else in the United States, owing to this permanency of abode, adaptation of climate to their preservation, and to the fact that it is largely uninhabited. In other parts of the country, stone implements in graves, bones and pottery are all we find, while, here, are the remains of houses and all the appurtenances of domestic life. The ruins of houses fall into two classes, pueblos and cliff-dwellings. The former are in the mesas or valleys, independent of natural rock walls for support; while the latter are wholly, or in part, under, or against cliffs. The former seem to have been the older, the latter becoming a necessity as the villages accumulated enough property and food to invite attack from the predatory tribes. The material of these houses was determined by their location. In the open it was of sandstone blocks, boulders, or adobe. Of the caves many were natural, others were excavated, and, in general, all were walled up, at least, in part.

Of these prehistoric ruins there are many notable examples. The archeologist whether professional or amateur can here revel to his heart's content. The capital city itself is founded upon the ruins of a city long ago dead and which, Phoenix-like, has risen from the ashes of a departed civilization. Between Phoenix and Tempe 10 miles away is one of the greatest ruins of the Toltecan castles, a huge quadrangle of debris surrounded by a hundred smaller piles that were once the main homes of a considerable town. Seven miles to the south is Los Muertos, or City of the Dead, where Frank Hamilton Cushing labored with such distinguished success. About eighteen miles from Casa Grande on the

Southern Pacific are the ruins of the same name, especially interesting, as it is the best preserved example of a type of structure, which there is reason to believe, was once widely distributed throughout the Gila Valley. It is, probably, the best known specimen of aboriginal architecture in the United States. The name is usually applied to the single structure left standing at the southwest corner of an area of debris, which doubtless represents the whole building. The length of the latter was about 400 feet and with a width of 240 feet; the portion still standing having a height of about 30 feet, representing three stories, and containing several rooms. It is not known just how old this ruin is, but it is generally thought to have been unoccupied when Coronado passed that way in 1540.

Throughout this region may readily be traced the lines of canals often of great size whereby these mysterious peoples of the long ago irrigated their crops of corn and beans. It has been estimated, and not without reason, that this southwestern country at one time supported a population of not less than 250,000.

Even as this great people has disappeared, so also are passing the present day aborigenes. The Indian of the Southwest is dying like the desert foliage after the spasmodic burst of leaf and flower following the period of rains. He is still picturesque, but is rapidly being merged into a most ordinary and relatively insignificant division of the body politic. The round-up Indians of the San Carlos and Mescalero reservation will remain with us until they give way to that natural law which prescribes that only those fit to survive will survive. The glorious days of Geronimo are a thing of the past.

There are about 25,000 Indians in Arizona to-day, the chief tribes being the Pimas, Maricopas, Papagoes, Apaches and Navahoes. Of these the Apaches are the best known, by reputation at least. Their name means "enemy", and they have fully lived up to its meaning. For three hundred years preceding the acquisition of this region by the United States, had Spain and Mexico been harassed by them. Even after 1853, they caused this government no end of trouble; Mexico went so far as to offer a head bounty on Apaches. In 1884, their ravages under the leadership of Geronimo, became so serious that General Sheridan sent General Crook to subjugate them. After a brief but brilliant campaign, a truce was arranged, and negotiations were under way looking to the Apaches' transfer to reservations, when Geronimo escaped. Two years later he was overcome by General Miles, sent to Fort Pickens, Florida, from whence he was transferred to Fort Sill, Oklohoma, where he died last year.

I had a good opportunity of observing for a week a village of Apaches in the Copper Creek canyon. The mining company had arranged with the agency at San Carlos for about a score of Indians to do road-making and other surface work, and they had traveled down a distance

of some sixty miles with camp equipage, women and children, to the number of 40 or 50, and had established themselves for the time being along a ravine adjoining camp. Their teepees were primitive in the extreme. They were hemispherical in shape, and frame being of ocatilla stalks, or Sahuara ribs, over which they laid a bunchy swamp-like grass some two or three feet in length, which they pull up by the roots. Then over this they stretch and stake down odd pieces of canvas, or sacking, to hold the grass in place, and to afford further protection from sun and rain.

The Indians themselves were hardly picturesque, clad in the unattractive raiment of a cheap civilization. The men in the omnipresent blue overall and other attire in keeping, did not seem much different from the average American laborer wherever you find him. All those at the camp with one exception wore the hair closely cropped and were without beard or mustache, which, together with their somewhat broader faces, enabled one to distinguish them from the ever-present Mexican "greaser", the main laborer of the country.

The women were distinctly tawdry and unattractive in the extreme in their soiled and faded red and blue garments of the cheapest cotton procurable. Their hair, straight and coarse, hung down all about their heads and was constantly being thrust back so that they could see. Everything about their teepees was dirty. They cook by setting pans on stones surrounding a small fire either inside the teepee or out according to the weather; all of a family eat out of a common dish. One afternoon I saw some squaws moving their teepee a rod or so, tearing it down and setting it up again on the new site, requiring about an hour. Upon making inquiry (not of them however) I found that that was their custom when one place became too dirty and full of vermin. It was easier to move than to clean house. The Apaches are most inveterate gamblers chiefly among themselves and for small stakes. One day on my way to the power-house which led by their camp, I purchased a bead chain and a small basket of a fat young squaw, giving her some small change for the articles. On the way back a few minutes later, she had gathered a group of women, a man and a boy about a blanket on the ground, and they were absorbed in a game in which my silver played a prominent part. They used the Mexican cards, and, although I watched the game for some time, I was unable to get all its details. Each put in a nickel or dime, and the winner raked in the pot, which was the essential thing. The superintendent at the mine told me that although they had a dozen bucks on the pay-roll at $1.50 a day, it scarcely ever happened that over six or eight worked at a time. They worked a few days, and then laid off to gamble their earnings. They are much addicted to liquor, whenever they can get it. There was none procurable at the camp, but their ingenuity overcame that with ease. There was constant wonder at the store this spring at the amount of corn-meal

they bought till it was discovered that they made it into crude alcoholic beverage. In its season they became drunk on mescal, the fermented juice of the agave; and, just before the corn is ripe, they ferment its green juice, and have a general orgie, during which time they are regarded as distinctly "bad medicine."

About Tucson, I saw more or less of the Papagoes whose reservation is a few miles out of town. Their women often come into town with loads of baskets, and three of them, squatting on the sidewalk outside the Santa Rita, did a good busines one morning with our party, for buying thus at first hand saves about half what you would have to pay at the curio dealers.

One morning we took a run up the Santa Cruz Valley to the celebrated Missions of San Xavier del Bac, a distance of nine miles from town, and in the midst of the Papago reservation. Just outside of the city proper is the portion set apart for the Papagoes, a sandy flat with their adobe houses scattered about in the midst of mesquite, creosote and cat's-claw. We met, and overtook a number of Papago women, some with large earthen jars on their heads, others with great bundles which our chauffer told us was family washing, being carried out to their homes to do. They were fine specimens of the Indian, physically, straight as arrows, probably brought about by the carrying of burdens on their heads. A few miles out we passed the Training School for Pima and Papago children, supported by the Women's Board of Missions of the Presbyterian church. It was recently removed from the city to this location, the Board having purchased one hundred sixty acres of rich farming land, and erecting buildings thereon at a cost of over $50,000. There are some 150 children in attendance. A few miles of desert then intervenes before reaching the reservation, where all is green with wheat, barley and alfalfa, the fields being traversed everywhere by that without which the land would be a barren waste—the irrigating ditch. Dotting the land here and there were groups of small adobe houses from which the Indians cultivate the adjoining fields. We pass, beside the road, the office and residence of Major Berger, the government agent; and we soon drew up before the most celebrated mission of southern Arizona, San Xavier del Bac. This mission was founded by the Jesuits in 1687, and the present edifice was completed somewhat later by the Franciscan Fathers. It stands, to-day, as a marvel of architectural skill and beauty, and a monument to the devotion of its founders. We called at a side door, were admitted by one of the sisters in charge, and procured tickets to the chapel where we spent some time in viewing the mural decorations and paintings, the works of carving and sculpture which show a master's hand. The building as a whole, as well as the decorations, is in an admirable state of preservation, owing to the dryness of the climate. Most of the exterior has been whitewashed, except the central portion in front, and the main entrance which has been left as of old. This building was doubtless the center of activity in the great Santa Cruz Valley two centuries ago. As a refuge for the peaceful Papagoes against the murderous Apaches, the bullet marks on the door offer silent testimony.

Of the Arizona Indians, special mention should be made of the Navahoes whose reservation farther north I did not visit. They are a peaceful pastoral people, devoted to basketry, weaving and working in silver. Their blankets, made from wool yarn, grown and spun by themselves, with designs in colors, vegetable in origin, and permanent, sell for large sums, as floor coverings to those who can afford them. This tribe does not live in communities, but in individual houses, usually dome-shaped and covered with earth.

In northeastern Arizona are the seven pueblos of the Hopi or Moki, probably the main remnant of the prehistoric pueblo people, while across the line in New Mexico is the city of Zuni, the sole survivor of its type, with 1,540 members of the tribe, a number which also represents the date of Coronado's capture of the place, a most interesting coincidence. This is probably the only pueblo in existence at that time that has persisted to this day, so it may truly be called the oldest continuously inhabited city in the United States.

When at Phoenix, I visited the government Indian Industrial School, where one may see about all the Indian types of the Southwest. We reached the school four miles out of town by trolley about two-thirty Sunday afternoon, just as the young savages, some seven hundred in number, were being marched from the dormitories to the lawn in the shade of the main building, where the regular Sunday services were held. A resident clergyman conducted the service, and one of the instructors led the congregational singing; the girls, about half the total body of students, faced the steps which served as a rostrum, on one side while the boys occupied the other. There were marked differences in the representatives of the various tribes as to physiognomy and expression; but all except some mischievous boys who amused themselves by pulling chairs from under their fellows, or by pinning things on their backs, seemed thoroughly stolid and apathetic, very few of them taking part in the singing, or listening to the sermon; but for this they were excusable. This school as its name indicates is industrial in character, and, aside from Carlisle and Haskell, is the largest in the country, according to the latest available report, although I am informed that the Chilocco Indian Agricultural School of Oklahoma has distanced them all in attendance. From my observations here and in other Indian schools, I am in doubt as to the value of the results obtained, but the government is surely trying. It is a part of "the white man's burden."

Now up to this time I have not mentioned several phases of the Southwest that you hear the most about while there. One of these is the climate, considered by many Arizonians as their chief asset. The combination of elements which make the climate is unusual, and cannot

be duplicated elsewhere. There is more sunshine, more aridity, more rapid evaporation, and, in consequence, more electricity in the air, which has given it a deserved reputation as a health resort. The percentage of sunshiny days is about seventy, and the sun shines some part of most of the others. There are two brief rainy seasons, one in winter, and the other in mid-summer. White harmless clouds may sail across the sky, but scarcely muster enough moisture to produce a shower. Sometimes rain may start to fall, but it evaporates in mid-air. It is not often that one will find an atmosphere so clear, so dry and tonic, or a sky so blue. Thousands of people spend their winters in Phoenix and Tucson for the sake of the outdoor life that is possible there. One of our noted naturalists, after a trip through Arizona, declared, "Certainly it is a land of health, and, if I am ever called upon to die in the East, I will go there, and live."

Another subject on everybody's tongue, there, is mining, and naturally so. More than one hundred years ago, Humboldt, the great geologist, after several years study of the mountains of the west, enthusiastically declared that Arizona was the treasure-vault of the world. While yet in its infancy, and with the ground, comparatively speaking, as yet unscratched, still Arizona leads the world in the production of the precious metals. This fact is not widely known, for its supremacy in the mining world has been but recently attained. The gross value of its production last year exceeded one million dollars a week, over 90% of this being copper. It has considerably outstripped, in the production of copper, both Michigan and Montana, its only rivals. Why, the value of the product of its mines in 1907 exceeded by about 40 millions the combined output of the celebrated Cripple Creek and Goldfield districts together. The Copper Queen Mine near Bisbee, most appropriately named, is the greatest producer of copper in the world, yielding, last year, over 80 million tons; the Calumet and Arizona Company, in six years, has paid its stockholders over nine million dollars in dividends, 165% on its capitalization being paid in 1907. Senator Clark of Montana, who owns over 90% of the stock of the United Verde Mine at Jerome, has refused 300 millions for his property. "A regular goldmine" is a good thing, but it is not to be compared with copper.

It is, however, to the agricultural possibilities of Arizona (whose name means "arid zone") that, strange to say, its citizens point with pride. This is the new Arizona, as it is also the old. Those mysterious people who built towns and vast houses, and dug canals from which to water the land, left no other record of themselves save that they were farmers. Where they led the water along the canals which they ran with precision, without the use of instruments, the American farmer now comes to renew the old farms, and repeat the ancient harvests by modern methods of culture. A notable addition to the works of our government in applied science is the creation of that Board of Engineers, known as

the Reclamation Service. It grew out of the Reclamation Act of 1902, setting aside the proceeds of sales of public lands in the thirteen states most needing it, and in the three territories, to be used in surveys and irrigation projects. This work is a natural outgrowth of the labors of the Geological Survey. Attention was first called to the possibilities along this line by Major J. W. Powell, and, when he became director of the Survey, much of its work was turned in this direction. About twenty years ago, he was instructed to investigate the extent to which arid regions might be reclaimed, and money was appropriated for that purpose. Five years later, specific appropriations were made for stream measurements, with particular reference to storage basins, and opportunities for diversion of the water upon the land. So, upon the passage of the Reclamation Act, seven years ago, much of the preliminary work had been done, and active operations were begun at once. Readers of current magazines have seen more or less of this work in the illustrated articles, appearing there from time to time. These projects are scattered over all the territory covered by the act; but three of the largest are in the Southwest, where the need seems to be at least as great as elsewhere; one is on the Rio Grande at El Paso, a second is on the Colorado near Yuma, and a third, now nearly completed, is the great Roosevelt Dam across the Salt River above Phoenix. This last typifies them all. The Salt River Valley, some 75 miles long and from 15 to 20 miles wide, was the center of the irrigating operations of the prehistoric people; and again, about thirty years ago, settlement began, independent or corporation ditches being put in till quite a part of the district was cultivated. But the water was too low at critical times, or "the rains descended and the floods came" and carried away their embankments. They were rebuilt time after time, till many of the land-owners became discouraged, and the land was again abandoned to the desert. The situation demanded government aid and supervision. So the Reclamation Service took charge, and, 70 miles to the eastward, was begun a dam, from base to summit 284 feet high and 1080 feet along the wagon-road which crowns its crest. It is practically one solid stone, being made of concrete, the cement for which was manufactured by the government on the spot. This will create, as a reservoir, a lake 20 miles long and covering 17,000 acres. Its capacity will be 1,300,000 acre-feet, or enough to cover the irrigable acre, 250,000 acres, five feet in depth. Further down, some 25 miles east of Phoenix, is a vast diversion dam which turns the current into the main canals on either hand, which send off feeders to the whole valley. In connection with the project is the development of from twenty to twenty-five thousand horse-power of electrical energy for transmission throughout the district. The government expects to spend in all, about $6,000,000, and this cost is to be assessed against the land, as will also a rental for water to keep the system in repair. The first cost is expected to be about $30 an acre, which is distributed over

ten years for payment; while the water-rental will probably not exceed $1.50 per acre, per annum.

Although the work is not yet completed, there is enough water available for the present area under cultivation, and the results are manifest. Land values have increased, till wild desert in the irrigated zone would cost you from $75 to $300 an acre, depending upon location. I saw in the window of a real-estate dealer in Phoenix placards of bargains (?) at from one to two hundred dollars an acre. I was told of orange groves that could not be purchased for $1,000 an acre. It sounds outrageous but, when one hears of the income from an acre, it is seen at once to be good interest on such a valuation. All the factors of successful farming are here. They have the soil, a detrital deposit, or alluvium, from the filling of a deep valley for ages with the washings from a vast watershed. A boring near Phoenix showed it to be 500 feet deep, another near Mesa showed 1,300 feet, then ending in clay. Given the soil, there is then needed warmth and moisture, and they have them both, twelve months of warmth and all the water they need, and, what is more to the point, WHEN they need it.

The range of farm products is probably as wide here as any place in the world. Barley, wheat, oats and corn are raised, but are too well known to detain us. Alfalfa is the main crop, being cut on an average six times a year, yielding over a ton per acre to the cut, and bringing twelve dollars a ton. Besides this, it furnishes some pasturage. You may imagine how cattle, horses, sheep and hogs consume it. Dairying has come to be a vast industry. Of fruits, the citrous i. e. oranges, lemons and grape-fruit are the most profitable, but can be grown in certain limited areas, only. Grapes, plums, pears, apricots, peaches and figs are raised extensively. Hundreds of carloads are shipped east and north annually. Strawberries ripen every month in the year. Some 25,000 acres near Glendale seem especially adapted to sugar-beets, and a great factory has been built there. Bee-keeping is profitable, the desert flowers yielding the honey; twenty-two carloads were shipped out last year. On account of climatic similarity to Africa and Arabia, olives have been tried and with astonishing success; and dates bid fair to become a leading product. The government has had, for a number of years, near Tempe, an experimental tract of twenty acres devoted to dates, and it has been so successful that many farms are being set out to date-palms. A new industry in the valley is ostrich farming; there are about a dozen such farms, one of them having over 1,800 birds. They are pastured on the alfalfa on which they thrive.

It is not surprising that in the midst of such surroundings, one should find the finest city of the Southwest, and the capital of the territory, Phoenix. Though we were in the city but a couple of days, all fell in love with its beauties. It is laid out with wide streets, well shaded, and with public buildings in the midst of parks. The capitol grounds are

particularly fine. The fact that it has an abundance of water is evident. It is more distinctly an American city than Tucson, there being no "old quarter" with its Mexican population, which gives the latter city its distinctly Spanish flavor. It is, I think, as pleasant a city as I was ever in. So, amidst the flowers and palms of Phoenix, I shall leave you, knowing that if you were there, there you would wish to remain.

Summer Sessions at the Minnesota State Normal Schools

SUMMER OF 1907.

	Duluth.	St. Cloud.	Winona.	Mankato.	Moorhead.	Total.
Total enrollment	150	466	250	465	401	1,732
Number present during first six weeks	145	447	235	450	362	1,639
Number present during second six weeks	60	218	135	115	269	797
Number present during twelve weeks	50	199	120	100	250	719
Number who had taught	90	306	105	204	275	890
Number graduated	5	8	35	16	18	82

SUMMER OF 1908.

Total enrollment	167	544	313	550	431	2,005
Number present during first six weeks	160	462	230	515	381	1,798
Number present during second six weeks	57	312	187	144*	278	978
Number present during twelve weeks	50	230	154	110*	228	772
Number who had taught	125	319	150	288	280	1,162
Number graduated	4	22	40	24	38	128

*Low attendance due to typhoid epedemic.

SUMMER OF 1909.

Total enrollment	165	574	283	533	473	2,028
Number present during first six weeks		507	264	474	401	1,646
Number present during second six weeks		288	137	200	291	916
Number present during twelve weeks		221	117	141	219	698
Number who had taught	100	365	142	303	314	1,224
Number graduated	11	44	49	32	45	181

*There was a seven weeks' session at Duluth.

Lines in Memory of Governor Johnson

By Edwin T. Reed.
Head of the Department of English.

[Read at a memorial service held September 23d at the Moorhead Normal]

High in a lonely hollow where the streams
Mirrored the magic of our boyhood dreams,
A mantled promontory, bright with bowers
Of green festoonery and flashing flowers,
Reared its fair front against the morning glow,
Wooing our footsteps in the long ago.

Sweet songsters nested in its woven vines,
Shy creatures refuged in its secret shrines;
The zephyred airs played round it, and the dews
Of paradisean distance, in rare brews
Refreshed its forehead with a daily joy.
And hither in glad ardor girl and boy
In romping exultation came and swung
Among the tangled arbor vines, or flung
Their breathless bodies on the leaping boughs,
Cheating the west-wind of his wild carouse.
And way-worn pilgrims, pausing, sank and sighed
With pious satisfaction, where the tide
Of fern-green billows tossed a fairy skiff
Sheer to the edges of the verdured cliff.
And glancing swallows loved it; butterflies
Foraged with bees among its blooms. The skies
Poured sunshine, moonshine round it, and all day
It lured a weary people to be gay.

A boon in nature, blest forevermore!
A thing of charm and gladness; but—no more!
The slothful quagmire near and nearer crept,
Where ambushed envy coiled itself and slept,
Forever plotting, as forever fain,
To sap its base and wreck its top—in vain.
And storms of envy, hurricanes of hate,

Came hurtling o'er it, as if hurled by fate,
Blighting its verdure, beating down its bloom,
And clouding all its loveliness in gloom.
But lo, the tempest past, above the shock
The column loomed majestical,—a rock!

Thus are the great established, trunk and arm;
The centered dignity, the circling charm;
Granite at core, to hold the steadfast place,
But granite clothed on with a kindlier grace;
Stern natures, tempered to the battle's stress
But infinite in love, in tenderness.
Carlyle was such, and such was Concord's Sage,
Writing their heart-throes on the enduring page;
And such was Lincoln, sad yet mirthful chief,
Who wrought high virtues through a people's grief.
And such was he, whose calm, heroic head
Lies like another's now—revered, but dead.
Revered, indeed! for o'er him where he sleeps
The North Star bows her diadem and weeps!

No more hereafter on the Forum's stage
The Citizen Idealist shall wage
In tones exalted his chivalric war
Against the wrongs that smart us. Ah, no more
Shall we behold him in his princely height;
No more take counsel with him, heed the right
Because he showed the way. Oh, ne'er again
Shall we companion with him among men!
Seek him henceforth, disbodied but elate,
The unseen pilot of a chastened state;
Seek him in souls, that, scorning fear and doubt,
Still make the lorn and lonely cause win out.
Seek him in lads, who, trembling, worn, and hushed,
Still look to him, courageous and uncrushed;
Seek him, in short, wherever patient grace
Still keeps the tired worker to his place;
Wherever helpfulness has lightened care,
Wherever faith is needed—he is there!

Changes in the Faculty

Retiring Members.

There have been many changes in the faculty since the last bulletin was issued, some due to professional changes and promotions, but some due to the ravages of the little god of love. At the beginning of the spring term Miss Harriett Rumball, teacher of reading, resigned, and later, at New York, became the bride of Hon. C. A. Nye, Resident Director of the school, who had just returned from a trip round the world. In June Miss Alice C. Pence, teacher of physical education, resigned, and in September, at Lexington, Ky., was married to Mr. Arthur E. Cannon of Fargo. In June, also, Miss Jessie Hazelton, teacher of music, severed her connection with the school; she has been spending the intervening months at her home in Chicago. Miss Benedict, who spent the summer and early fall abroad, is at her home in Kasson, Minn., on leave of absence for the fall term; but will resume her work as teacher of drawing in November. Miss Abbie Day, who filled one of the critic positions in the model school last year, is enjoying an interval of rest and recreation at her home in Minneapolis. Miss Wharton, who taught Latin last year during Miss Donaldson's leave of absence, is teaching at Pillsbury Academy, Owatonna, where she also holds the position of Preceptress. Miss Elizabeth Donaldson, who after eight years of service to the school as head of the department of Latin, spent the past year, in company with Miss Jessie Comstock, at Oxford University and in Italy, has decided not to resume her teaching in the normal school, and is taking advanced work at Columbia. Mr. J. P. Laughlin, who for three years had charge of manual training at the normal, is now in charge of the work in this department in the public schools of Peoria, Ill. Mr. Quigley, who for four years had charge of the department of psychology, resigned in August to accept an appointment as assistant professor of education in the college of education at the State University.

Incoming Members.

Superintendent E. R. Collins, of Fort Madison, Ia., succeeds Mr. Quigley as teacher of psychology and history of education. For the past two years Mr. Collins has been superintendent of the public schools of Fort Madison, a city of 10,000 inhabitants. He was educated in the public schools of Kirksville, Mo., and at the Iowa State University, where he secured the degrees of B. S. and M. A. Subsequently he completed work in the department of education at the University of Iowa which entitles him to the degree of Ph. D. He has had a varied experience in educational work, which has included teaching from the rural school upward. For four years he was principal of the high school at Iowa City, the seat of the State University. He is married, and since coming

to Moorhead has taken up his residence with Mrs. Collins, at 511 4th street south.

Mr. J. Harold Powers, who joined the normal at the opening of the summer session, came to the school from Crookston, where he has been director of music and manual training in the public schools for two years. Mr. Powers is a graduate of the Crane Musical Institute at Pottsdam, N. Y., and of the Pottsdam State Normal School. He has studied with eminent teachers of music in New York City, and has had successful experience in teaching music in both studio and public school work. In addition to his musical training Mr. Powers has had excellent training in manual arts at the Bradley Polytechnic Institute in Brooklyn. Since coming to Moorhead, Mr. Powers has established his family, a wife and infant daughter, in a home at 121 Sixth street south.

Miss Ruth Hutchinson, who was formerly preceptress at Wheeler Hall, has returned to the normal school after a year's work in English at Teachers' College, Columbia, where she secured the degree of M. A. She is now in charge of the Latin department, and is welcomed back to her friends in this community with genuine enthusiasm.

Miss Mary Neer joins the faculty as critic teacher in the intermediate department of the model school. Her home is in New Jersey. She is a graduate of Teachers' College, Columbia, and has had successful experience as a teacher in the East.

Miss Florence Meyer succeeds Miss Pence as teacher of physical education. Her home is at Yonkers, N. Y., and she has taught in New York City. She is a graduate of Barnard College, and has a master's degree from Columbia.

Miss Gertrude Peters comes to establish and carry on the new department of domestic science. She is a native of Michigan, her home being at Springport. She is a graduate of the State Agricultural College of the University of Michigan, and took a year's graduate work at Columbia, where she received her master's degree last June. She has had experience as a teacher, and in her work in the summer school, as an organizer of new enterprises, manifested her competence as an executive.

Miss Elizabeth Keppie, who, last March, succeeded Miss Rumball as teacher of reading, is from Pawtucket, Mass. She was educated in the public schools of that city, and in the Pawtucket Training School, where she was also a teacher. She graduated at the head of her class from Emerson College of Oratory, and has had experience as a teacher in all grades of public school work. She has already established herself as one of the conspicuous successes in the galaxy of the normal's reading-teachers.

Northwestern Minnesota Educational Meeting

The 1909 meeting of the Northwestern Minnesota Educational Association will convene, as usual, at Crookston, on Thursday, November 11th, and continue through Friday and Saturday, November 12th and 13th. Superintendent G. E. Keenan of Warren is president, and, under his enthusiastic direction, an excellent program has been arranged. The leading school men of the state will be in attendance, and Dr. Winship, Editor of the Boston School Journal, will give one of the evening addresses. Other notable lectures will be supplemented by such liberal musical and entertainment features as are characteristic of the Crookston meetings. A large attendance and a brilliant program are assured.

Events of the Quarter

Bessie Van Houten, '03, is special teacher of music in the public schools of Wadena.

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At the August state teachers examinations 119 applicants from this place were successful in securing certificates.

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Ivy Wagner, '01, has resumed her art work in the illustrating firm at Minneapolis with which she was connected last year.

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During the second half of the summer session Dr. Gulick of New York gave a valuable lecture on the physiological side of school life.

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Mr. Kingsford gave an inspiring address at the Congregational church on Sunday morning, October 3rd, his subject being "Five Great Teachers."

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The business district of Moorhead has been greatly improved during the summer by the construction of about 14 blocks of paving, covering all the principal business throroughfares.

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Pres. C. C. Creegan, D. D., is the new president of Fargo College. Mr. Creegan has been District Secretary for the American Board of Foreign Missions of the Congregational church.

* * *

R. W. Richards, editor of the Daily News, gave an illuminating talk to the teachers of the public schools in early October on the subject, "English in the schools from the standpoint of the Business Man."

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Miss Scofield entertained the ladies of the faculty informally on Saturday evening, October 2nd, at the Pederson home on Eighth street,

where she displayed her souvenirs from Europe, beautiful fabrics, pictures, and artistic pieces of handiwork.

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Preston W. Search, the eminent lecturer and author, who called at the school while on his way to the Pacific coast, made an eloquent address before the school on September 16th, based on the recollections of a visit he once made to the school in Switzerland founded by Pestalozzi.

* * *

A new Federal building, which will accommodate both the post office and the weather bureau, will be erected in Moorhead within a year or two. A site costing approximately $5,000 has already been purchased, and the Government has taken the initial steps toward the erection of a building.

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Miss Scofield, who spent the summer in Europe with Miss Benedict, touring England, France, Germany and the Mediterranean countries, returned to Moorhead September 27th to resume her teaching in the model school. She was not only much refreshed and benefited by her trip, but so satisfied with its returns in inspiration that she is planning on a subsequent trip.

* * *

The faculty enjoyed the usual fall picnic on Monday, September 27th, when they made an excursion to the banks of the Sheyenne west of Fargo. Weather conditions were ideal for an outing,—a mild, sunny afternoon, a moonlight evening, and good roads,—so that the drive, the savory viands, the good company, and the autumn scenery, were unclouded by any disturbing shadows.

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The new fire-proof dormitory, which is to cost $75,000 when completed, is already under course of construction. The excavation for the foundation was completed in August, and in September the walls were being rapidly raised. The structure, which stands east of Wheeler Hall and parallel with it, will be a fine piece of school architecture. It will be ready for occupancy in May, 1910.

* * *

Charles W. Seymour gave three lectures at the normal school in October which cannot be overpraised. From every point of view—whether of scholarship, accuracy, eloquence, or human interest—they measured up to the highest standard. Those who heard them will never forget his vivid characterizations of Marie Antoinette, Pericles, and Father Marquette; they were heroic portraits of real people.

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Mr. A. M. Hopeman, city engineer, has been appointed superintendent of construction of the new dormitory, and under his expert direction the work has been progressing smoothly since early September. Mr. Hopeman is a man of sane judgment and absolute probity, and his selection

by the Board of Control was a fortunate appointment that gives confidence to the community as well as to the authorities of the school.

* * *

Miss Elizabeth Donaldson, for eight years head of the department of Latin in the normal school, is studying in Teachers' College, Columbia. Miss Donaldson's withdrawal from the normal school faculty is a distinct loss to the institution and the community. A brilliant woman, of superior scholarship, she was not only an exceptionally fine teacher of her special subject, at the normal, but a skillful teacher of English as well, a subject to which her good taste and general culture brought unusual illumination.

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At a meeting of the executive committee of the Northwest-Central Minnesota Educational Association, held at Breckenridge, September 18th, the date of the 1910 meeting was fixed for Thursday and Friday, February 3rd and 4th. The place of meeting will be Moorhead, and the central theme of the program will be "The time element in education." The members of the executive committee—Supt. O. S. Vail, Supt. Charlotte Knudson, and Mr. Edwin T. Reed—are soliciting the cooperation of all school people in this section of the state in their effort to make this meeting of vital interest.

* * *

Both the senior and junior classes begun activities early and have shown a zealous inclination to make their class organizations count for something during the year. The seniors, who organized early in the year, selected officers as follows: Counselor, Mr. Kingsford; President, Lucy Weld; Vice-President, Harry Larson; Secretary, Olga Lommen; Treasurer, DeEtte Cenfeld. The juniors, who organized immediately after the seniors, made the following selection of leaders: Counselor, Mr. Powers; President, Arnold Trost; Vice-President, Paul Tjonn; Secretary, Katie Nevramon;Treasurer, Minnie J. Engles.

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Supt. F. E. Lurton having resigned as head of the city schools of Moorhead, to take a similar position at Anoka, Supt. H. R. Edwards of Morris was elected to this position in August. Supt. Edwards is a cultured and experienced school man, and has taken hold of the situation in Moorhead with a firm and tactful policy. A practical innovation in school administration that he has instituted is the employment of an accountant and stenographer. Among his corps of teachers the following are graduates of the Moorhead normal school: Irene Murphy, Ruth E. Donaldson, Mary Lamb, Louise Hamson, Lucy Sheffield, Ruby Pilot, Gene Peterson, Katie Lobben, Julia Sharp, and Mary Curran.

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During the summer several improvements were made in the main building. The old rooms of the model school on the basement floor were renovated, redecorated and furnished. The eighth grade room, in the

northeast corner, with a smaller office room adjoining, was converted into a department for geography. A lounging room for the men of the faculty was also fitted up on this floor. The intermediate room, in the southeast corner, was fitted up for general recitation purposes. Later, either this room or another of ample proportions, will be devoted to the uses of the Forum and other literary societies. On the main floor the walls of the corridor were re-decorated, and several of the rooms were overhauled by carpenters and painters.

* * *

The Y. W. C. A. has been thoroughly alive during the summer and fall. On August 14 the Association secured the cooperation of the faculty in conducting a progressive lawn fete for the purpose of raising funds. The fete was carried out very successfully on August 14, the stations being the Weld lawn, the Ballard lawn, the Stanford lawn, and the normal campus. Through this means, and by the help of subscriptions from the students and faculty, three delegates were sent to the national convention at Geneva, Wis. The delegates, Miss Newman, Miss Beatrice Peterson, and Miss Edna Beardsley—together with Miss Ash, who was also in attendance—gave the Moorhead normal school the best representation of any normal school in the country, and the local society, through the reports of its members, received an undoubted impetus from the meeting. Miss Newman was one of the speakers at the factulty council, an organization newly undertaken in connection with the Y. W. C. A., the object of which is to enlist the interest and co-operation of the teachers in the aims of the association throughout the country.

* * *

When Mr. Quigley's withdrawal from the normal schoool faculty became known, his students in the summer school, including the seniors and advanced students, gave a banquet in his honor at the Gardner in Fargo. The affair was elegantly appointed and was a handsome tribute to the distinquished talents and devoted service of Mr. Quigley. Nothing could have been more expressive of the esteem in which Mr. Quigley is held among the members of the normal community. His exact scholarship, his quiet initiative, his energizing power as a teacher, and above all his absolute integrity of character, have won the admiration and affection of all who, as students and fellow teachers, have come to know him during his four years service at the normal. The regret of losing him from the normal school is softened somewhat by the fact that he is still in the state system, and by the further fact that his work at the College of Education is such that he will devote much of his time to extension work throughout the state, and will thus come occasionally into closer contact with his many friends in this section. All his friends here rejoice at his promotion, which is deserved and timely.

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Following are the lecturers who have already been engaged to give

Sunday evening addresses at the Grand Theatre, under the auspices of the Grand Free Lecture Association:

Mrs. Philip N. Moore, St. Louis, Mo.
Prof. A. E. Minard, Agricultural College.
Prof. E. A. Boehmer, Fargo College Conservatory.
Dr. O. G. Libby, University of North Dakota.
Pres. J. H. Worst, Agricultural College.
Dr. J. Paul Goode, University of Chicago.
Pres. W. J. Kerr, Corvallis, Oregon.
Prof. H. M. Stanford, Moorhead Normal.
Mr. S. Johnson, Bismarck, N. D.
Pres. E. A. Bryan, Pullman, Wash.
Mr. C. B. Smith, Washington, D. C.
Prof. W. I. Thomas, University of Chicago.
Dr. G. F. Ruediger, Grand Forks, N. D.
Prof. E. F. Ladd, Agricultural College.
Pres. F. L. McVey, University of North Dakota.
Prof. W. C. Wilcox, University of Iowa.
Pres. F. A. Weld, Moorhead Normal.

* * *

President Weld has made several addresses since school opened in September, among the more notable being the address which he gave at the Congregational Church on Sunday morning, September 19th, the address commemorative of Governor Johnson, delivered at the memorial exercises held at the school on September 23rd, and the Convocation Address which he delivered at the University of North Dakota on October second.

The address on Sunday morning was a broad and sympathetic analysis of human nature as the basis of religious faith and spiritual ideals.

The address in memory of Governor Johnson was an inspiring exposition of the character and life-lessons of the lamented leader. It awakened profound interest, and excited the most earnest and outspoken praise of all who heard it. It was a symmetrical tribute which can not be summarized. Beginning with a poetic reference to the Star that led the wise men of the East, it unfolded the purposeful strivings of John A. Johnson through his successive periods of service until he attained the eminence that seemed to promise a direct path to the possibility of the highest office in the service of the American people. It closed with an eloquent summary of the life-lesson taught by Governor Johnson. His life, said President Weld, was a life of endeavor rather than of accomplishment. It was a life of noble achievement. He was a splendid exponent of American institutions, of the possibility of achievement under American conditions. No where else in all the world could such a career have been possible. His life will be an incentive to the youths of Minnesota for all time. Governor Johnson was a man of ideals. He